

SUPPORT FOR THE AMENDMENTS

Support for the amendment of claim 35 is found on page 13, lines 1-7, in the specification.

Support for the amendment of claim 42 is found beginning on page 20, line 22 and bridging to page 21, in the specification.

Support for the amendment of Claim 43 is found on page 10, lines 10-17, in the specification.

Support for the amendment of claim 52 is found on pages 36-41, in the specification.

Support for the amendment of claim 55 is found on page 42, lines 1-10, in the specification.

Support for the amendment of claim 56 is found on page 42, lines 1-10, in the specification.

Support for the amendment of claim 57 is found on page 42, lines 1-10, in the specification.

No new matter is believed added to this application by entry of this amendment.

Claims 33-61 are active. Claims 35, 42 and 52-61 have been constructively withdrawn.

REMARKS/ARGUMENTS

The claimed invention is directed to a polarizing electrode for an electrical double layer capacitor containing an activated carbon which has been prepared to have an alkali metal content less than 60 ppm and/or a heavy metal content of less than 20 ppm. The activated carbon according to the claimed invention is obtained by an **alkali activation treatment method of an easily graphitizable carbonaceous material**.

Applicants have described alkali activation beginning at line 25, page 33, and continuing to line 21, page 36 in the specification. According to this description an easily graphitizable carbonaceous material is mixed with an alkali metal hydroxide and heated to a specific activation temperature. Heating and cooling rates, temperatures and times are described.

An easily graphitizable carbonaceous material is described beginning at line 12 on page 30 and continuing to line 18, page 32. Applicants respectfully note that according to the cited description, the easily graphitizable carbonaceous material is one selected from the group consisting of a petroleum coke, a petroleum pitch, a synthetic mesophase pitch, a polyvinyl chloride, a polyimide and a polyacrylonitrile and in the activation process described, the raw material is melt-spun into fibers for an infusibilizing treatment wherein the fiber configuration is maintained. These fibers are then pulverized to a maximum length of long axis for the alkali activation treatment (page 32, lines 8-11).

Applicants have determined that conventional activated carbon for use in electronic devices such as electrical double layer capacitors, which is washed with a strong acid contains problematic residual levels of alkali and heavy metals. These metals are reductively deposited to form metal dendrites which cause a problem of low rate of electrostatic capacitance retention due to the self-discharging which results from the dendrite formation. Applicants have discovered that by employing the specific washing methods according to the claimed invention, to the carbon after the activation treatment, and preparing polarizing electrodes for an electrical double layer capacitor with the activated carbon thus treated provides polarizing electrodes for an electrical double layer capacitors having significantly improved performance properties.

The claimed invention provides polarizing electrodes for an electrical double layer capacitor according to Claims 33, 36 and 43 and claims dependent thereon and the methods

for preparing the polarizing electrodes according to Claims 42, 52, 55, 56, 57 and claims dependent thereon. No such polarizing electrodes for an electrical double layer capacitor are disclosed or suggested in the cited references.

The Restriction and withdrawal from consideration of claims 35, 42 and 52-61 is respectfully traversed.

37 C.F.R. § 1.475(b) states in pertinent part:

“An international or a national stage application containing claims to different categories of invention will be considered to have unity of invention if the claims are drawn only to one of the following combinations of categories:

(1) A product and a process specially adapted for the manufacture of said product; . . .”

Applicants respectfully submit that the Office has not considered the relationship of the claims with respect to 37 C.F.R. § 1.475(b)(1), and therefore has failed to meet the burden necessary in order to sustain the requirement for restriction. Applicants therefore request that the requirement for restriction be withdrawn.

Applicants respectfully note the Office’s comment that (Official Action dated October 17, 2008, page 3, lines 4-6):

“The specification implies that carbonic acid treatment is vital for alkali removal, but claim 36 does not recite this step- and even teaches alkali activation. Applicants should resolve this ambiguity in their response.”

Applicants respectfully note that withdrawn method claims 35, 42, 52 and 55-57 are herein amended to depend from claims 33, 36 and 43, as supported and described in the Support for Amendments above. These amendments and the cited support, as well as the description throughout the specification show that the claimed invention provides several methods to obtain the activated carbon and correspondingly the claimed polarizing electrodes

for an electrical double layer capacitor according to the invention. Treatment with water containing carbonic acid is not recited in every method as now described by the claims.

Applicants have shown in Tables 1-5, that alkali metal activation, combined with the specific treatment as described in the invention provides activated carbons which when employed in polarizing electrodes for an electrical double layer capacitor result in significant improvement in rate of self-discharge retention. For example in Table 1, inventive examples A-1 and A-2 were treated with a system which includes carbonated water, while comparative examples A-1 and A-2 were not. As shown, the % rate of self-discharge retention of the electrical double layer capacitors made with A-1 and A-2 show a greater than 10% improvement over the comparative capacitors.

In Table 2, inventive examples B-1 and B-2 were treated with a system which includes ammonia after activation while comparative examples B-1 and B-2 were not treated with ammonia. Again better than 10% improvement in the % rate of self-discharge retention is obtained. In Table 3, inventive examples C-1 and C-2 were treated with a system including hydrogen peroxide, whereas comparative example C-1 was not. Greater than 40% improvement in the % rate of self-discharge retention was obtained in the inventive electrical double layer capacitors. Similar results are shown in Table 4 due to treatment of the activated carbon samples according to a method of the claimed invention. The % improvement in each of Tables 1-4 are shown in the following Table where the % increase in rate of self discharge retention of the inventive example over the related comparative is expressed.

| Example | % Increase |
|---------|------------|
| A-1 | 11.1 |
| A-2 | 10.5 |
| B-1 | 10.8 |
| B-2 | 15.9 |
| C-1 | 42.1 |
| D-1 | 41.0 |
| D-2 | 69.3 |
| D-3 | 17.4 |

The rejection of Claims 33-34, 36-41 and 43-51 under 35 U.S.C. 102(b) and 35 U.S.C. 103(a) over Nakamura et al. (Influence of physical properties of activated carbons on characteristics of electrical double-layer capacitors; J. Power Sources; 60 (1996) 225-231) is respectfully traversed.

Nakamura neither discloses nor suggests a polarizing electrode for an electrical double layer capacitor, as described in any of claims 33, 36 and 43.

Nakamura describes polarizable electrodes of double-layer capacitors obtained from activated carbons having differing physical properties, including activated carbons based on

coconut shell, phenolic resins, mineral oil and coal. Only Samples G-J describe an alkali activation and none of the origin materials described (Mineral oil and Coal) are the easily graphitizable carbonaceous material of the claimed invention.

Applicants note the Office's comments that (Official Action dated October 17, 2008, page 4, lines 9-11) that:

“No weight is given to Applicants Markush group reciting petroleum coke, pitch, etc., as ultimately it is activated and the only relevant characteristic to the product claim is the presence of activated carbon.”

Applicants respectfully submit that the term easily graphitizable carbonaceous material is described in the specification (page 30, line 12 to page 32, line 18) as melt spun fibers prepared from the specific materials recited in the Markush listing, which have specific dimensional properties (page 32, lines 8-11) and therefore the claim description considered in view of the specification recites specific properties of the invention which are not disclosed or suggested in the cited reference.

Moreover, the Office has further stated (Official Action dated October 17, 2008, page 4, lines 11-14) that:

“Since Applicants claim the alkali content in terms of a maxima (i.e., “content of heavy metals is X or less”), the claims read on a content of zero ppm. Stated differently, Applicants have effectively written the alkali treatment out of the claim insofar as the product claims are concerned.”

Applicants respectfully submit that such a contention disregards an important aspect of the claimed invention, where according to the invention, following alkali activation, the described treatment methods can effectively lower the metals contents of the activated carbon to the claimed ranges. Applicants recite alkali activation and such language cannot be disregarded. Moreover, Applicants have shown significant improvement in performance obtained in the claimed invention.

Nowhere does the cited reference disclose or describe a polarizing electrode for an electrical double layer capacitor comprising an activated carbon prepared by alkali treatment of an easily graphitized carbonaceous material having the specific alkali metal and heavy metal contents according to claims 33, 36 and 43, of the claimed invention.

Nakamura is silent regarding alkali and heavy metal content and does not disclose or suggest any treatment following activation to lower alkali and/or heavy metal content.

Applicants previously submitted an article by Kim et al. (Hydrogen production by catalytic decomposition for methane over activated carbons: kinetic study; International journal of Hydrogen Energy; 29 (2004) 187-193),(Amendment filed July 24, 2008). Tables 1 and 2 in this article show that carbons activated by steam treatment, obtained from coconut and coal both have significant levels of alkali and heavy metals and would not inherently have the metal contents described in the claimed invention, without treatment following activation similar to the description of claims 35, 42,52, 55-57 and claims dependent thereon.

The Office has cited Applicants' specification at page 12, lines 2-11, in support of its position and apparently contending that Applicants are ambiguous in their description. However, Applicants respectfully submit that the cited description of the invention is directed to methods to treat the activated carbon after activation and is not inconsistent with the claimed invention as the Office apparently alleges.

In view of all the above, Applicants respectfully submit that the cited reference neither discloses nor suggests the description of the claimed invention, and therefore cannot anticipate or render obvious the claimed invention. Withdrawal of the rejection of Claims 33-34, 36-41 and 43-51 under 35 U.S.C. 102(b) and 35 U.S.C. 103(a) over Nakamura is respectfully requested.

Applicants respectfully request that if the invention of Group I is found allowable, the non-elected claims which depend from the allowed claims be rejoined (MPEP § 821.04).

Applicants respectfully submit that the above-identified application is now in condition for allowance and early notice of such action is earnestly solicited. Applicants further respectfully request that the withdrawn claims which depend from the allowed claims be rejoined (MPEP § 821.04).

Respectfully submitted,

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